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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/601,147	06/19/2003	Lawrence C. Gunn III	LUX-P004	7226

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EXAMINER	
CHIEM, DINH D	
ART UNIT	PAPER NUMBER
2883	

DATE MAILED: 07/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/601,147	GUNN ET AL.	
	Examiner	Art Unit	
	Erin D. Chiem	2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 May 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the amendment filed on May 12, 2005. Claims 1, 2, 4, 5, 8, 15, 16, 17, 19, 20, 23-26, 30, 32, and 35-38 are amended, and claim 40 is new. Claims 1-40 are pending.

Drawings

1. The objection to the drawings with reference to numeral 203 in Figure 2 is now withdrawn upon consideration of the amendment to the specification.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1 –11, 14-25, and 28-30, 31, 37 – 40 are rejected under 35 U.S.C. 102(a) as being anticipated by Bosco et al. (US 2003/0015707 A1). Figure 58, Bosco et al. discloses an array of optical grating coupler 5106 fabricated on a compound monocrystalline semiconductor material 5118. The monocrystalline semiconductor material have been previously disclosed has being selectable from the group of, for example, gallium arsenide, gallium indium arsenide, gallium aluminum arsenide, indium phosphide, cadmium sulfide, cadmium mercury telluride, zinc selenide, zinc sulfur selenide, and the like in any of the Group IIA and VA elements, mixed II-V compounds, Group II and VIA elements, and mixed III-VI compounds [0042]. All of the above compounds are considered to be usable as semiconductive material As seen in Figure 58

substrate 5118 and 5116 are separated by the visible vertical line, therefore, this drawing reads upon the amended claim 1 of a "first substrate" and a "second substrate." Upon the substrate 5118, and array of waveguides 5126 are optically aligned to the array of optical grating couplers 5106. The devices used in Bosco's demultiplexer include photodiodes 5110, waveguides 5126, transimpedance amplifier 5112 etc.; the array of optical devices. In operation, light in the optical waveguides 5126 impinges on the photodiodes 5110, producing electrical signals related to the split optical signal in the waveguide 5126. The transimpedance amplifier 5112 amplifies the signal produced by the photodiode 5110 and produces an output signal at the signal output 5114. See [0209]. Furthermore, in Fig. 59, the transistors that are on the substrate in the optical grating couplers 5106 are visible, even though Bosco et al. do not explicitly disclose the transistors in the disclosure of this specific embodiment. And it is well known in the art that the most common method of forming transistors is with the CMOS process [0114]. Thus, the waveguides makes the physical connections between substrate 5118 and 5116 with the photodiode and the lines connecting to the transimpedance amplifiers are the electrical connections between the array of optical devices and the first substrate. Regarding claims 6 – 7 and 21 – 22, respectfully, through the Applicant's own admittance that c4 solder bonds employing gold bums are "commonly involved in commercial bump bonding... [and] flip-chip operations. See claim 7, 21, and 22. Regarding claims 14, 15, 29, and 30, Bosco et al. disclose the method of fabricating semiconductor structure utilizing the formation of a compliant substrate from monocrystalline materials. Bosco et al. teach employing bonding the template material to the surface of the buffer layer at selective sites to provide sites for the nucleation of the epitaxial growth of the

monocrystalline material layer [0043]. And upon this grown layer, the unwanted insulating layers are etched away to form the electro-optic devices upon the substrate [0121].

Regarding claim 31, in one embodiment of the structure, in which one skilled in the art can fabricate optical devices such as array of optical grating couplers, waveguides, photodiodes, and similar optical components, Bosco et al. disclose a monocrystalline substrate 22 is a silicon substrate and further having a buffer zone, a second substrate, made of indium-phosphide; the substrates ar4e chemically bonded together [0055-0056], [0043].

Regarding claims 37-39, Figure 31, and 32 demonstrate the well-known assembly of a device use to convert optical signal to electricity and vice versa with a combination of devices comprising a photo emitter or optical laser, array optical grating, photodetector, a bipolar junction, and a transistor, etc. [0140]. Furthermore, Bosco et al. disclose how light distribution is performed through the AWGM 5006, 5010.

> "This device splits the incoming light signals into an integer number m, ... identical signals. Each signal contains all of the wavelengths of the incoming signal. Each of the m signals is then fed into its own optical waveguide. The path length of each optical waveguide is designed so that there is a calculated length difference between the adjacent waveguides. Through constructive and destructive interference, the composite waveguides and output starcoupler function as a diffraction grating separating the signal into n separate signals. The number of waveguides m determines the spacing between wavelengths... Each of these signals is then fed into its own optical waveguide. Other methods could be substituted to achieve this function, such as using a Bragg grating, and so on." [0203].

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 12 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bosco et al. (US 2003/0015707) in view of Magne et al. (US 6,226,426 B1).

In Figure 58, Bosco et al. disclose an array of optical grating coupler 5106 fabricated on a compound monocrystalline semiconductor material 5118 and the array of optical grating couplers are aligned with the waveguides formed on the substrate, which are etched on, but Bosco et al. do not disclose the array of optical grating couplers is designed to match the mode field of the array of optical devices.

Magne et al. disclose mode matching to increase the coupling efficiency between the gratings coupling to the etched zone (col. 8, line 29-33).

Since Bosco et al. and Magne et al. are both from the same field of endeavor, the purpose disclosed by Magne et al. would have been recognized in the pertinent art of Bosco et al.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to match the fundamental mode field, the most important mode in optical transmission via waveguides. If the mode[s] is/are not matched, dispersion of the transmitting signal occurs and as equally importantly dramatic power loss occur and the transmitted signal is more prone to err when exiting from the demultiplexer.

Claims 32 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamon (US 5,285,258) in view of Ford (US 6,272,272 B1) and Anderson et al. (US-2003/0057363 A1).

Kamon discloses having diffractive grating array formed on a semiconductor wafer acting as a alignment mark and further measures the intensity of light, the diffractive grating array is detected, which leads to accurately detecting the alignment mark (Abstract). With regard to the amended limitation of "wherein the first and second substrates are stacked such that the first and second substrates are substantially parallel to each other"; Figure 15 of Kamon's teaching shows reference numeral 1 as the array of optical grating couplers stacked on the second substrate 50 such that they are parallel to each other. But Kamon does not disclose aligning the first of the array of optical devices to the first of the array of optical grating couplers, then aligning the last of the array of optical devices to the last of the array of optical grating couplers, and attaching the array of optical devices to the array of optical grating couplers.

Ford discloses actively aligning a linear array of devices and then the aligned devices are then permanently joined by laser welding (col. 2, line 19 – 20). Furthermore, the array is aligned in the manner that the first and last elements in the array (col. 2, line 39 – 40). The motivation of employing such alignment method and attaching the devices together after alignment is intuitive. Alignment process is time consuming; therefore, one well-known in the art would find it reasonable to attach the aligned devices to prevent future realignment. It is also intuitive to align a linear array by exactly aligning the first device in the array and the last device in the array for the entire array to be aligned. For example, in wrapping a gift, one would place a piece of tape to hold together the seam of a present, one would accurately aim the first end of the tape and the

last end of the tape at the desired position and the pieces of tape in between would follow the aligned ends.

Since Kamon and Ford are both from the same field of endeavor, the purpose disclosed by Ford would have been recognized in the pertinent art of Kamon.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to align a linear array of devices such as an array of grating couplers by aligning the first and last device for the alignment of the devices in the middle to follow. Furthermore, active alignment is time consuming; it is intuitive for one well known in the art to attach the array of optical devices to the array of optical grating couplers to prevent alignment per use.

Claim 33, 35, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamon in view of Ford as applied to claim 32 and 34 above, and further in view of Giboney et al. (US 6,318,909 B1).

Kamon and Ford disclose the method of attaching an array of optical devices to an array of optical grating couplers formed on a substrate by forming a plurality of alignment marks on the substrate, silicon wafer, and aligning the array of grating coupler by aligning the first and the last grating, and finally attach the grating couplers to the devices, which are now aligned. But Kamon and Ford do not disclose a method of using a vision system with pattern recognition for automated alignment.

Giboney et al. disclose pattern recognition as a method employed an automatic aligning process for optical devices and the aligning members to position (col. 13, line 67 – col. 14, line 1 – 7). Alternatively, Giboney et al disclose 2 other aligning methods for alignment by (1)

sending optical signals to the end of the fiber optic ribbon from the alignment connector, and determine the best signal-to-noise ratio generated by the optic device while the position of the optical device is optimized (col. 14, line23 – 30). (2) Another method is send electrical signals to the transmitting elements via the electrical connector to cause the transmitting elements to generate optical signals. The optical signals at the end of the fiber optic ribbon remote from the alignment connector are monitored, and the position of the assembly relative to the device package is manipulated until the optical signals have a maximum signal-to-noise ratio, or some other indication of an optimal alignment of the assembly is obtained col. 14, line 11 – 23).

Since Kamon, Ford, and Giboney et al. are all from the same field of endeavor, the purpose disclosed by Giboney et al. would have been recognized in the pertinent art of Kamon and Ford.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ the automatic aligning process to assemble the casing which house the optical apparatus. Connecting members and the predrilled holes on the casing is typically used to hold the casing together. The examiner, respectfully, interpret the broad claim 33 to be utilize in holding the casing which house the apparatus together since the Applicant do not further indicate in the Specification as to the uniqueness or in descriptive explanation of when the automated alignment process is used in the method for attaching an array of the optical devices to an array of optical grating couplers. Furthermore, claim 35 and 36 are inventive definitions of active alignment method, and this is well known in the art. Any alignment linear arrays of optical devices employ the method of active alignment. Although, Giboney et al.

disclose using an optic fiber ribbon, but a waveguide or optical fibers may easily replace the fiber ribbon and the same method may be used.

Response to Arguments

4. Applicant's arguments filed on May 12, 2005 have been fully considered but they are not persuasive.

- Regarding the argument that Bosco fails to teach an array of optical grating couplers fabricated on a first substrate and an array of optical devices on a second substrate where the array of optical grating couplers is optically aligned to the optical devices is moot. Applicant must review the reference in its full disclosure because clearly as stated in the previous rejection with reference to Figure 58, there are two substrates 5118, 5116 and the optical grating couplers 5106 lies on the first substrate 5118 and the array of optical devices lie on the second substrate 5116.
- Regarding the argument with reference to claim 31 arguing that "the indium phosphide layer referred by Bosco...is not a substrate (such as substrate 22)." The Examiner's response is a quizzical reply of "How should substrate 22 be such?" since Applicant broadly claimed "where the substrates are mechanically fixed in optical alignment." The substrates are "mechanically" aligned and then bonded.
- Regarding the argument with reference to claims 12 and 27; the level of understanding is taught and understood by a person having ordinary skill in the art. Clearly, Magne teaches a method of "increasing the effectiveness of diffraction of the grating by mode field matching" when one of ordinary skill in the art "concentrates the

field of the fundamental mode on [to] the...zone"; for these are the steps that one of ordinary skill does to match a mode field.

- Regarding the argument with reference to claims 32, 35, and 36 is moot. The Examiner clarified the previous rejection, see above rejection under 35 U.S.C. 103(a) and please refer to Fig. 15 concentrating on substrate 1 stacked onto substrate 50 such that the two substrates are substantially parallel.

Thus, the Examiner reasserts the rejection in light of the newly amended claims.

Conclusion

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erin D. Chiem whose telephone number is (571) 272-3102. The examiner can normally be reached on Monday - Thursday 9AM - 5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Erin D Chiem
Examiner
Art Unit 2883

Frank G. Font
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